

2.2.1. Environment

To establish a consistent base for analysis we have selected a few basic environmental and device constraints. These should be used as bounds for calculations, modeling, simulation and device design and should flow from phase to phase.

- Target: flat, Lambertian target, reflectivity $\rho > 10\%$
- Target size: 2.3 meters square
- Specified atmosphere: $C_n^2 < 2 \times 10^{-13} \text{ m}^{-2/3}$, r_o at 1.06 μm : 2 mm at 10 km (5 mm at 2 km)
- Day and night operation
- Receiver Diameter, $D_R < 15 \text{ cm}$
- Imager: Eye-safe
- 90% confidence Interval for all measurements unless otherwise noted.

2.2.2. HPLD Program Metrics

Phase 1 Target in the Loop Adaptive Optics Metrics (18 MAC)

- Target in the Loop Active Optics – build and demonstrate @ 2km with at least 80% of the path $< 10 \text{ m}$ above the ground
- IR imager: resolution: $< 140 \mu\text{rad}$
- Root Mean Square (RMS) image dancing: $< 50 \mu\text{rad}$
- At target diameter: D_{beam} variable from $< 140 \mu\text{rad}$ to $> 500 \mu\text{rad}$ ($1/e^2$) via adjustable optics
- RMS beam wander: RMS beam wander $< 45 \mu\text{rad}$ over a period of 2 minutes for D_{beam} of 1 m
- Active Optics update rate (corrected images delivered to the operator): $\geq 10 \text{ fps}$
- Designator laser demonstration: 1.064 μm laser designator, $< 100 \text{ mJ/pp}$ @ variable prf 10 Hz – 20 Hz, 15% electro efficiency, $\tau < 15\text{-}20 \text{ ns}$
- Designator System: traceable to $< 6.0 \text{ kg}$, $< 14000 \text{ cc}$

Phase 2 Pointing Accuracy Metrics (30 MAC)

- Pointing accuracy: $< 100 \mu\text{rad}$
- Integrated optics (Active Optics, sight, eye safe ranger, designator laser): build and demonstrate @ 10 km with at least 50% of the path $< 10 \text{ m}$ above the ground
- Active Optics update rate (corrected images delivered to the operator): $> 30 \text{ fps}$
- Range accuracy: $< 1.5 \text{ m}$ (eye-safe)
- System power consumption: $P_{\text{avg}} < 50 \text{ W}$, exclusive of designator laser
- Integrated System: traceable to $< 6.0 \text{ kg}$, $< 14000 \text{ cc}$

Phase 3 System Integration and Demonstration Metrics (48 MAC)

- Pointing accuracy: $< 33 \mu\text{rad}$
- Designation range: 10 km
- Target position: @10 km $< 0.5 \text{ m}$ (x,y,z) from actual relative GPS position with a 50% confidence interval
- Imaging resolution @10 km: $< 100 \mu\text{rad}$
- LOS stabilization: $< 33 \mu\text{rad}$
- Tracking: 10 mrad/sec with target in field of view and operator manually tracking
- Size: $< 0.5 \text{ ft}^3$ (14000 cc)
- Weight: $< 6 \text{ kg}$
- Battery life: 12 hrs, 75 runs
- Cost: $< \$33,000$ per unit at 10,000th unit

NOTE: see <http://www.darpa.mil/ato/solicit/HPLD/index.htm> for Proposer's Day briefing and clarification questions and answers